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EXAMINER	
DOLE, TIMOTHY J	
ART UNIT	**PAPER NUMBER**
2858	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/058,191	BURDICK ET AL.
	Examiner	Art Unit
	Timothy J. Dole	2858

-- *The MAILING DATE of this communication appears on the cover sheet with the correspond nce address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-62* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35,37-40 and 46-62* is/are rejected.

7)☒ Claim(s) *36 and 41-45* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 July 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 34, 51300 - 51316. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: s1300, s1302, s1304, and s1308. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities: “42” should be removed on page 2, line 7.

Appropriate correction is required.

5. Claims 4-6, 18, 19, 23-25, 36 and 52 are objected to because of the following informalities: Claim 4 recites the limitation "the snap-on cap" on line 3. Claim 18 recites the limitation "the second capacitor" on line 1. Claim 23 recites the limitation "the environmental parameter" on line 1. Claim 36 recites the limitation "the two co-planar rings" on line 3. Claim 52 recites the limitation "the initial condition ambient oscillation frequency value" on lines 1 and 2. There is insufficient antecedent basis for these limitations in the claims. Claims 5 and 6 are objected to for depending on objected claim 4. Claim 19 is objected to for depending on objected claim 18. Claims 24 and 25 are objected to for depending on objected claim 23. Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claim 1, 2, 11-14, 20, 59 and 62 are rejected under 35 U.S.C. 102(e) as being anticipated by Pinto et al.

Referring to claim 1, Pinto et al. discloses a capacitive sensor for measuring a stimulus parameter, the sensor comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)); a metallic diaphragm (fig. 6 (202)) coupled to the circuit

board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance, the metallic diaphragm being adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter (column 1, lines 47-50), whereby the capacitance changes in accordance with the change in the stimulus parameter (column 2, lines 15-21); and an oscillator circuit (fig. 5 (136)) including a low-pass filter (fig. 5 (132)) and coupled to the transducer capacitor, the oscillator circuit being configured to generate a filtered signal characterized by a frequency, whereby the frequency changes in accordance with capacitance changes (column 2, lines 15-21).

Referring to claim 2, Pinto et al. discloses the sensor as claimed wherein the metallic diaphragm becomes substantially curved in response to the stimulus parameter (column 4, lines 17-22).

Referring to claim 11, Pinto et al. discloses the sensor as claimed wherein the low-pass filter includes an impedance element (fig. 4A (120)) coupled to a first shunt capacitor (fig. 4A (130)).

Referring to claim 12, Pinto et al. discloses the sensor as claimed wherein the impedance element includes a resistor, or an inductor (fig. 4A (120)), or both.

Referring to claim 13, Pinto et al. discloses the sensor as claimed wherein the first shunt capacitor is coupled to AC ground (fig. 1 (110)). It should be noted that the capacitor is connected to lead (131) which connects to the housing (110), which is assumed to be grounded.

Referring to claim 14, Pinto et al. discloses the sensor as claimed wherein the low-pass filter is connected to the input of the transducer capacitor (fig. 2 (129)).

Referring to claim 20, Pinto et al. discloses the sensor as claimed wherein the metallic diaphragm (fig. 6 (202)) does not include an attached metallic plate.

Referring to claim 59, Pinto et al. discloses a capacitive pressure sensor for measuring a stimulus parameter, the sensor comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)); a metallic diaphragm (fig. 6 (202)) coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance, the metallic diaphragm becoming substantially curved (fig. 2) relative to the at least one metallic layer in response to a change in the stimulus parameter such that the capacitance changes in accordance with stimulus parameter changes (column 2, lines 15-21); and an oscillator circuit (fig. 5 (136)) coupled to the transducer capacitor, the oscillator circuit being configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes (column 2, lines 15-21).

Referring to claim 62, Pinto et al. discloses a capacitive sensor for measuring a stimulus parameter, the sensor comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)); a metallic diaphragm (fig. 6 (202)) coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance, the metallic diaphragm not including an attached metallic plate (fig. 6), the metallic diaphragm being adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter (column 1, lines 47-50)

such that the capacitance changes in accordance with stimulus parameter changes (column 2, lines 15-21); and an oscillator circuit (fig. 5 (136)) coupled to the transducer capacitor, the oscillator circuit being configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes (column 2, lines 15-21).

8. Claims 49-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Frick.

Referring to claim 49, Frick discloses a method for calibrating a capacitive sensor used to measure a stimulus parameter, the method comprising: providing a sensor including a capacitor transducer (fig. 1) and an oscillator circuit (fig. 3 (125)), the capacitor transducer being characterized by a variable capacitance that varies in accordance with a change in the stimulus parameter (column 1, lines 54-63); determining a correction factor (A) by comparing an initial condition to an ambient condition (column 24, lines 9-30); determining the frequency corresponding to the stimulus parameter during ambient conditions (column 17, lines 7-17); and correcting the stimulus parameter by multiplying the correction factor by the frequency, whereby a corrected frequency value is obtained (column 17, lines 20-44). It should be noted that the initial condition is known since the position of the capacitors is known when the pressure of the fluid is zero.

Referring to claim 50, Frick discloses the method as claimed wherein the step of determining further comprises the steps of obtaining an initial condition factory oscillation frequency value (f_0) (column 24, lines 9-30); obtaining an initial condition ambient condition frequency value (f_1) (column 17, lines 7-17); and dividing the initial condition factory oscillation frequency value by the initial condition ambient condition

frequency value (column 17, lines 20-50). It should be noted that the correction factor (A) is a zeroing constant, which is set at zero differential pressure (column 18, lines 1-3).

Referring to claim 51, Frick discloses the method as claimed wherein the initial condition factory oscillation frequency value is obtained when the sensor is configured in a zero stimulus state (column 24, lines 9-30).

Referring to claim 52, Frick discloses the method as claimed wherein the initial condition ambient oscillation frequency value is obtained when the sensor is configured in a zero stimulus state (column 24, lines 9-30).

Referring to claim 53, Frick discloses the method as claimed wherein the correction factor equals, $C = f_0/f_1$ (column 17, lines 20-50). It should be noted that the correction factor (A) is a zeroing constant, which is set at zero differential pressure (column 18, lines 1-3).

Referring to claim 54, Frick discloses the method as claimed wherein the corrected frequency equals, $f_c = C^* f_s$, f_s being the frequency corresponding to the stimulus parameter during ambient conditions (column 17, lines 20-50). It should be noted that the correction factor (A) is a zeroing constant, which is set at zero differential pressure (column 18, lines 1-3).

Referring to claims 55-58, Frick discloses the sensor as claimed wherein the stimulus parameter is pressure, force, displacement or humidity (column 2, lines 54-66). It should be noted that the sensor of Frick could measure the stimulus parameters listed above since all the parameters would cause a change in the capacitance of the sensor.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 3-10, 60 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinto et al. in view of Pechoux et al.

Referring to claim 3, Pinto et al. discloses the sensor as claimed, further comprising a pressure port assembly (fig. 6 (210b)) coupled to the conductive ring, whereby a cavity (fig. 6 (204)) is formed between a pressure port and the metallic diaphragm.

Pinto et al. des not disclose a conductive ring disposed between the metallic diaphragm and the circuit board.

Pechoux et al. discloses a conductive ring (fig. 2 (8)) disposed between the metallic diaphragm and the circuit board.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the conductive ring of Pechoux et al. into the sensor of Pinto et al. for the purpose of ensuring electrical connections are made whereby leading to results that are more consistent and accurate (column 4, line 66 – column 5, line 1).

Referring to claim 4, Pinto et al. discloses the sensor as claimed except wherein the pressure port assembly further comprises: a cap coupled to the conductive ring; and a compressible sealer element disposed between the cap and the metallic diaphragm,

whereby substantially symmetrical forces are applied to the metallic diaphragm to thereby seal the cavity.

Pechoux et al. discloses a pressure port assembly further comprising: a cap (fig. 2 (2)) coupled to the conductive ring; and a compressible sealer element (fig. 2 (6)) disposed between the cap and the metallic diaphragm, whereby substantially symmetrical forces are applied to the metallic diaphragm to thereby seal the cavity.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the cap and sealer element of Pechoux et al. into the sensor of Pinto et al. for the purpose of providing a sealed chamber so that no liquid escapes when pressure is applied whereby leading to a more accurate measurement (column 3, lines 18-27).

Referring to claim 5, Pinto et al. discloses the sensor as claimed except wherein the compressible sealer element has a substantially rectangular cross-section.

Pechoux et al. discloses a sensor wherein the compressible sealer element has a substantially rectangular cross-section (fig. 2).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the rectangular compressible sealer element of Pechoux et al. into the sensor of Pinto et al. for the same purpose as given in claim 4, above.

Referring to claim 6, Pinto et al. discloses the sensor as claimed except wherein the compressible sealer element includes an o-ring.

Pechoux et al. discloses a sensor wherein the compressible sealer element includes an o-ring (fig. 2 (6)).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the o-ring of Pechoux et al. into the sensor of Pinto et al. for the same purpose as given in claim 4, above.

Referring to claim 7, Pinto et al. discloses the sensor as claimed except wherein the circuit board includes a metallic land disposed between the conductive ring and the circuit board, the metallic land being adapted to support the conductive ring.

Pechoux et al. discloses a sensor wherein the circuit board includes a metallic land (fig. 2 (8a)) disposed between the conductive ring and the circuit board, the metallic land being adapted to support the conductive ring.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the metallic land of Pechoux et al. into the sensor of Pinto et al. for the same purpose as given in claim 3, above.

Referring to claim 8, Pinto et al. discloses the sensor as claimed except wherein the metallic land is co-planar with the at least one metallic layer.

Pechoux et al. discloses a sensor wherein the metallic land (fig. 2 (8a)) is co-planar (fig. 2) with the at least one metallic layer (fig. 2 (11)). It should be noted that the top surface of (8a) and the bottom surface of (11) are in the same plane and therefore are considered to be co-planar.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the co-planar metallic land and metallic layer of Pechoux et al. into the sensor of Pinto et al. for the purpose of controlling spacing and contact points whereby making measurements more consistent (column 5, lines 33-39).

Referring to claim 9, Pinto et al. discloses the sensor as claimed except wherein the circuit board includes at least one guard ring disposed within a thickness of the circuit board, the guard ring being adapted to reduce stray capacitance between the metallic diaphragm and the metallic layer.

Pechoux et al. discloses a sensor wherein the circuit board includes at least one guard ring disposed within a thickness of the circuit board (column 5, lines 29-45), the guard ring being adapted to reduce stray capacitance between the metallic diaphragm and the metallic layer.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the guard ring of Pechoux et al. into the sensor of Pinto et al. for the purpose of reducing costs and eliminating stray capacitances whereby leading to more accurate measurements (column 5, lines 29-45).

Referring to claim 10, Pinto et al. discloses the sensor as claimed wherein the at least one guard ring mitigates the effects of sensor performance variations due to temperature induced variations of a dielectric constant of the circuit board (column 7, line 56 – column 8, line 2).

Referring to claim 60, Pinto et al. discloses a capacitive sensor for measuring a stimulus parameter, the sensor comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)); a metallic diaphragm (fig. 6 (202)) coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance, the metallic diaphragm being adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter (column

1, lines 47-50) such that the capacitance changes in accordance with stimulus parameter changes (column 2, lines 15-21); a pressure port assembly (fig. 6 (210b)) coupled to the conductive ring, whereby a cavity (fig. 6 (204)) is formed between a pressure port and the metallic diaphragm; and an oscillator circuit (fig. 5 (136)) coupled to the transducer capacitor, the oscillator circuit being configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes (column 2, lines 15-21).

Pinto et al. does not disclose a conductive ring disposed between the metallic diaphragm and the circuit board.

Pechoux et al. discloses a conductive ring (fig. 2 (8)) disposed between the metallic diaphragm and the circuit board.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the conductive ring of Pechoux et al. into the sensor of Pinto et al. for the same purpose as given in claim 3, above.

Referring to claim 61, Pinto et al. discloses a capacitive sensor for measuring a stimulus parameter, the sensor comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)); a metallic diaphragm (fig. 6 (202)) coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance, the metallic diaphragm being adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter (column 1, lines 47-50) such that the capacitance changes in accordance with stimulus parameter changes (column 2, lines 15-21) and an oscillator circuit (fig. 5 (136)) coupled to the transducer capacitor, the oscillator circuit being configured to generate a signal

characterized by a frequency that changes in accordance with capacitance changes (column 2, lines 15-21).

Pinto et al. does not disclose the circuit board includes at least one guard ring disposed within a thickness of the circuit board, the guard ring being adapted to reduce stray capacitance between the metallic diaphragm and the metallic layer.

Pechoux et al. discloses a sensor wherein the circuit board includes at least one guard ring disposed within a thickness of the circuit board (column 5, lines 29-45), the guard ring being adapted to reduce stray capacitance between the metallic diaphragm and the metallic layer.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the guard ring of Pechoux et al. into the sensor of Pinto et al. for the same purpose as given in claim 9, above.

11. Claims 15-19 and 21-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinto et al. in view of Wallrafen.

Referring to claim 15, Pinto et al. discloses the sensor as claimed except for a second capacitor disposed between the transducer capacitor and AC ground to form a voltage divider.

Wallrafen discloses an evaluation circuit for a capacitive sensor wherein a second capacitor (fig. 2 (7)) is disposed between the transducer capacitor (fig. 2 (6)) and AC ground to form a voltage divider (column 1, lines 34-38). It should be noted that at certain points in the oscillation of generator, the capacitor (7) would be grounded.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the second capacitor of Wallrafen into the sensor of Pinto et al. for the purpose of inexpensively and reliably evaluating a signal from a capacitive sensor (column 1, lines 29-33).

Referring to claim 16, Pinto et al. discloses the sensor as claimed wherein the low-pass filter includes a series impedance element (fig. 4A (120)) coupled to the input of the transducer.

Pinto et al. does not disclose a capacitor disposed between an output of the transducer and AC ground to thereby form a voltage divider.

Wallrafen discloses a capacitor (fig. 2 (7)) disposed between an output of the transducer (fig. 2 (6)) and AC ground to thereby form a voltage divider (column 1, lines 34-38).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the second capacitor of Wallrafen into the sensor of Pinto et al. for the same purpose as given in claim 15, above.

Referring to claim 17, Pinto et al. discloses the sensor as claimed wherein the series impedance element includes resistor, or an inductor (fig. 4A (120)), or both.

Referring to claims 18 and 25, Pinto et al. discloses the sensor as claimed except wherein a second capacitor forms a capacitance divider with an inter-plate capacitance generated between the metallic diaphragm and the metallic layer.

Wallrafen discloses a second capacitor (fig. 2 (7)) forms a capacitance divider with an inter-plate capacitance generated between the metallic diaphragm and the metallic layer (column 1, lines 34-38).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the second capacitor of Wallrafen into the sensor of Pinto et al. for the same purpose as given in claim 15, above.

Referring to claim 19, Pinto et al. discloses the sensor as claimed except wherein the capacitance divider is configured to reduce diode conduction within an input circuit of the oscillator.

Wallrafen discloses the capacitance divider is configured to reduce diode conduction within an input circuit of the oscillator. It should be noted that diodes are part of the oscillator and the reduction in diode conduction occurs naturally due to the capacitance divider provided by Wallrafen.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the capacitive divider of Wallrafen into the sensor of Pinto et al. for the same purpose as given in claim 15, above.

Referring to claim 21, Pinto et al. discloses a capacitive sensor for measuring a stimulus parameter, the sensor comprising: a capacitor transducer (fig. 6) including at least one fixed plate member (fig. 6 (216)), the capacitor transducer being characterized by a variable capacitance, whereby the variable capacitance varies in accordance with a change in the stimulus parameter (column 2, lines 15-21); and an oscillator circuit (fig. 5 (136)) coupled to the capacitor transducer, the oscillator circuit including a low-pass filter

(fig. 5 (132)) coupled to an input of the capacitive transducer, having a frequency, whereby the frequency is proportional to the stimulus parameter (column 2, lines 15-21).

Pinto et al. does not disclose the oscillator circuit generating a non-sinusoidal signal.

Wallrafen discloses an oscillator circuit generating a non-sinusoidal signal (fig. 2 (21)).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the non-sinusoidal signal of Wallrafen into the sensor of Pinto et al. for the purpose of avoiding ripple in the output whereby leading to more accurate measurements (column 2, lines 11-15).

Referring to claim 22, Pinto et al. discloses the sensor as claimed except for a first circuit loop disposed in series with the capacitor transducer, the first circuit loop providing a non-inverting gain to the filtered signal; and a second circuit loop disposed in parallel with the capacitor transducer, the second circuit loop providing an inverting gain to the filtered signal.

Wallrafen discloses a first circuit loop disposed in series with the capacitor transducer, the first circuit loop providing a non-inverting gain to the filtered signal; and a second circuit loop disposed in parallel with the capacitor transducer, the second circuit loop providing an inverting gain to the filtered signal column 3, lines 5-16). It should be noted that the first circuit loop goes through switch (11) where it is inverted twice, providing a non-inverted gain and the second circuit loop goes through switch (12) where it has only passed through the inverting amplifier.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the circuit loops of Wallrafen into the sensor of Pinto et al. for the purpose of suppressing the signal to smooth the output whereby leading to more accurate measurements (column 1, line 64 – column 2, line 1).

Referring to claims 23 and 27-30, Pinto et al. discloses the sensor as claimed wherein the stimulus parameter is fluid pressure, pressure, force, displacement or humidity (column 4, lines 12-16). It should be noted that the sensor of Pinto et al. could measure the stimulus parameters listed above since all the parameters would cause a change in the capacitance of the sensor.

Referring to claim 24, Pinto et al. discloses the sensor as claimed, further comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)); and a metallic diaphragm (fig. 6 (202)) coupled to the circuit board and juxtaposed to the metallic layer to thereby form the variable capacitor transducer, the metallic diaphragm being adapted to move relative to the at least one metallic layer in response to a change in the fluid pressure (column 1, lines 47-50), whereby the variable capacitance changes in accordance with the change in the fluid pressure (column 4, lines 12-16).

Referring to claim 26, Pinto et al. discloses the sensor as claimed wherein the low-pass filter includes a shunt capacitor (fig. 4A (130)) and a resistor (fig. 4A (120)). It should be noted that since (120) is an impedance element, it could be replaced by a resistor.

12. Claims 31-35, 37-40 and 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinto et al. in view of Frick.

Referring to claim 31, Pinto et al. discloses a capacitive sensor system for measuring a stimulus parameter, the system comprising: a circuit board (fig. 6 (214)) including at least one metallic layer (fig. 6 (216)) disposed therein; a metallic diaphragm (fig. 6 (202)) coupled to the circuit board to thereby form a variable capacitor (fig. 6), the variable capacitor being characterized by a variable capacitance, the metallic diaphragm being adapted to move relative to the at least one metallic layer in response to a change in a stimulus parameter (column 1, lines 47-50), such that the capacitance is varied in accordance with stimulus parameter changes (column 2, lines 15-21); and an oscillator circuit (fig. 5 (136)) disposed on the circuit board and coupled to the variable capacitor, the oscillator circuit including a low-pass filter (fig. 6 (132)) configured to generate a filtered signal characterized by a frequency that changes in accordance with the capacitance.

Pinto et al. does not disclose a processor coupled to the oscillator circuit, the processing circuit being configured to derive a value of the stimulus parameter from the frequency.

Frick discloses a capacitive sensor with a processor (fig. 4 (179)) coupled to the oscillator circuit, the processing circuit being configured to derive a value of the stimulus parameter from the frequency (column 16, lines 57-61).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the processor of Frick into the sensor of Pinto et al. for the

purpose of calculating information based on the output signal from the oscillator, whereby making it possible to determine the parameter being input into the sensor (column 17, lines 33-44).

Referring to claim 32, Pinto et al. discloses the sensor as claimed wherein the at least one metallic layer includes two co-planar rings (fig. 8 (150)) disposed on a surface of the circuit board.

Referring to claim 33, Pinto et al. discloses the sensor as claimed wherein the metallic diaphragm is grounded (fig. 6). It should be noted that the diaphragm is conductive and is attached to the housing, which is assumed to be grounded.

Referring to claim 34, Pinto et al. discloses the sensor as claimed wherein the two co-planar rings are inter-digitated (figs. 8 and 9). It should be noted that the rings are inter-digitated by through-hole (152).

Referring to claim 35, Pinto et al. discloses the sensor as claimed wherein the two co-planar rings are characterized by a spiral shape (fig. 9).

Referring to claim 37, Pinto et al. discloses the sensor as claimed except wherein the processor includes a gain correction circuit, the gain correction circuit being configured to multiply a number representing the frequency by a correction factor.

Frick discloses the processor includes a gain correction circuit (fig. 3 (179)), the gain correction circuit being configured to multiply a number representing the frequency by a correction factor (column 17, lines 12-44).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the processor and correction factor of Frick into the sensor of Pinto et al. for the same purpose as given in claim 31, above.

Referring to claim 38, Pinto et al discloses the sensor as claimed except wherein the correction factor equals an initial zero-pressure frequency value divided by an ambient zero-pressure frequency value.

Frick discloses the correction factor equals an initial zero-pressure frequency value divided by an ambient zero-pressure frequency value (column 17, lines 20-44). It should be noted that the correction factor (A) is a zeroing constant, which is set at zero differential pressure (column 18, lines 1-3).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the processor and correction factor of Frick into the sensor of Pinto et al. for the same purpose as given in claim 31, above.

Referring to claim 39, Pinto et al. discloses the sensor as claimed except wherein the processing circuit includes a counter circuit configured to determine the frequency of the filtered signal.

Frick discloses the processing circuit includes a counter circuit (fig. 4 (177)) configured to determine the frequency of the filtered signal.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the processor and counter circuit of Frick into the sensor of Pinto et al. for the same purpose as given in claim 31, above.

Referring to claim 40, Pinto et al. discloses the sensor as claimed except wherein the counter circuit employs a frequency counting method.

Frick discloses the counter circuit employs a frequency counting method (column 17, lines 7-17).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the processor and counter circuit of Frick into the sensor of Pinto et al. for the same purpose as given in claim 31, above.

Referring to claims 46-48, Pinto et al. discloses the sensor as claimed wherein the stimulus parameter is pressure, force or displacement (column 4, lines 12-16). It should be noted that the sensor of Pinto et al. could measure the stimulus parameters listed above since all the parameters would cause a change in the capacitance of the sensor.

Allowable Subject Matter

13. Claims 36 and 41-45 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to show the state of the art with respect to capacitive sensors.

USPN 5,844,769 to Maier: This patent shows a pressure transducer with a metal plate and o-rings.

USPN 5,798,462 to Briefer et al.: This patent shows a conductive diaphragm with an oscillator network and multiple insulating and conductive layers.

USPN 5,150,275 to Lee et al.: This patent shows a capacitive pressure sensor where the housing is clamped to the base to secure the diaphragm.

USPN 5,006,952 to Thomas: This patent shows a capacitive transducer with guard rings.

USPN 4,295,376 to Bell: This patent shows a force responsive transducer with a processor and guard rings.

USPN 4,090,513 to Togawa: This patent shows a pressure transducer that detects humidity.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J. Dole whose telephone number is 703-305-7396. The examiner can normally be reached on Mon. thru Fri. from 8:00 to 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Le can be reached on 703-308-0750. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

TJD
April 3, 2003

N. Le
Supervisory Patent Examiner
Technology Center 2800